# Using Open Systems Architecture to Revolutionize Capability Acquisition

**Acquisition Reform Symposium**
**13 May 2015**

**Nickolas Guertin, PE**

DASN RDT&E, Director for Transformation

Nickolas.H.Guertin@navy.mil

**Co-authored by Robert Sweeney & Douglas Schmidt, PhD**

Opinions expressed are those of the authors & do not reflect official policy or position of the US Government

Distribution Statement A: Approved for public release

# Report Documentation Page

*Form Approved*
*OMB No. 0704-0188*

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

| 1. REPORT DATE | 2. REPORT TYPE | 3. DATES COVERED |
|---|---|---|
| **13 MAY 2015** | | **00-00-2015 to 00-00-2015** |

| 4. TITLE AND SUBTITLE | 5a. CONTRACT NUMBER |
|---|---|
| **Using Open Systems Architecture to Revolutionize Capability Acquisition** | 5b. GRANT NUMBER |
| | 5c. PROGRAM ELEMENT NUMBER |
| 6. AUTHOR(S) | 5d. PROJECT NUMBER |
| | 5e. TASK NUMBER |
| | 5f. WORK UNIT NUMBER |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Deputy Assistant Secretary of the Navy (DASN) for ,Research Development Test and Evaluation (RDT&E),1000 Navy Pentagon 4C656,Washington,DC,20350** | 8. PERFORMING ORGANIZATION REPORT NUMBER |
| 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) | 10. SPONSOR/MONITOR'S ACRONYM(S) |
| | 11. SPONSOR/MONITOR'S REPORT NUMBER(S) |

12. DISTRIBUTION/AVAILABILITY STATEMENT
**Approved for public release; distribution unlimited**

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

| 16. SECURITY CLASSIFICATION OF: | | | 17. LIMITATION OF ABSTRACT | 18. NUMBER OF PAGES | 19a. NAME OF RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| a. REPORT **unclassified** | b. ABSTRACT **unclassified** | c. THIS PAGE **unclassified** | **Same as Report (SAR)** | **21** | |

# Imperatives for Continuous Improvements -1

- **Capability Improvements Needed**
  - The United States' military technological superiority is being challenged … This is not a future problem, nor is it speculative. My concerns are based on the intelligence reports I have received on a daily basis for almost five years.

    —Hon. Frank Kendall
    Under Secretary of Defense for Acquisition Technology & Logistic, December 2014

# Imperatives for Continuous Improvements -2

- **Systems must be updated quickly for CYBERSAFE**
  - Cybersecurity standards must be applied & re-applied to every system throughout its service life, not just at initial acquisition. Once it delivers, even if it delivers perfectly — zero vulnerabilities, zero attack surface — the *next day,* it will be vulnerable because of a new discovery, a new zero day [exploit].

    — VADM Jan Tighe, Commander, 10th Fleet, 20 April 2015

# The Naval Business Model – Top-Level Strategy

## Procure Basic Platforms

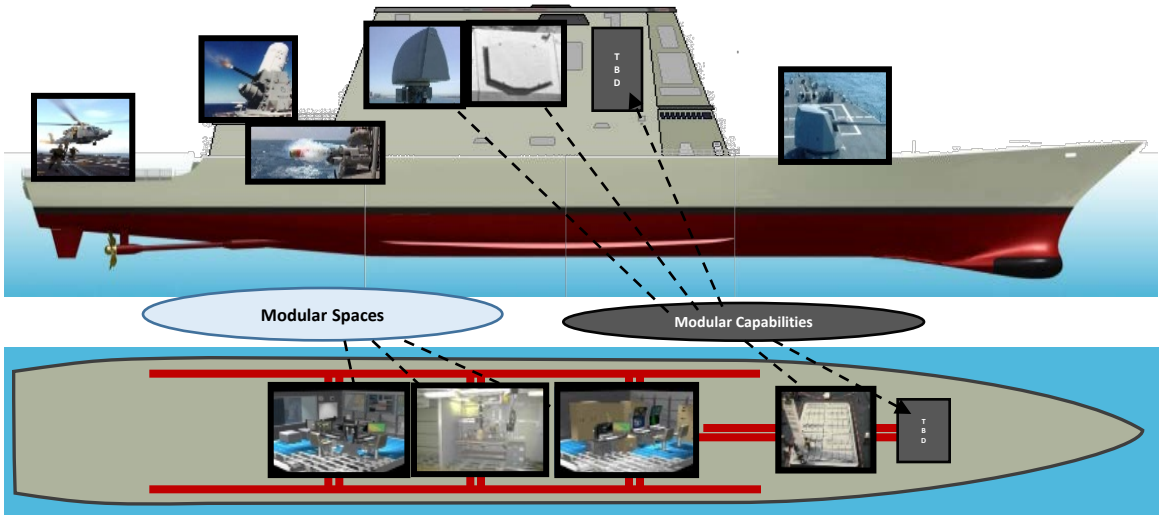
- Decouple the mission systems & integration from the platform
- Able to quickly change modular components for future flexibility
- Stabilize platform production – segregate from rapid change

## Develop/Maintain Capability Product Lines

- Reduce & manage vendor-locked & stove-piped products
- Improve core competencies across the force
- Design for robust, affordable testing
- Build in adaptability

## Integrate & Deliver

- Manage Platform-unique elements
- Reduce acquisition cost & risk
- Spur innovation & enhance warfighter capability



# The Naval Business Model – Top-Level Strategy

## Procure Basic Platforms

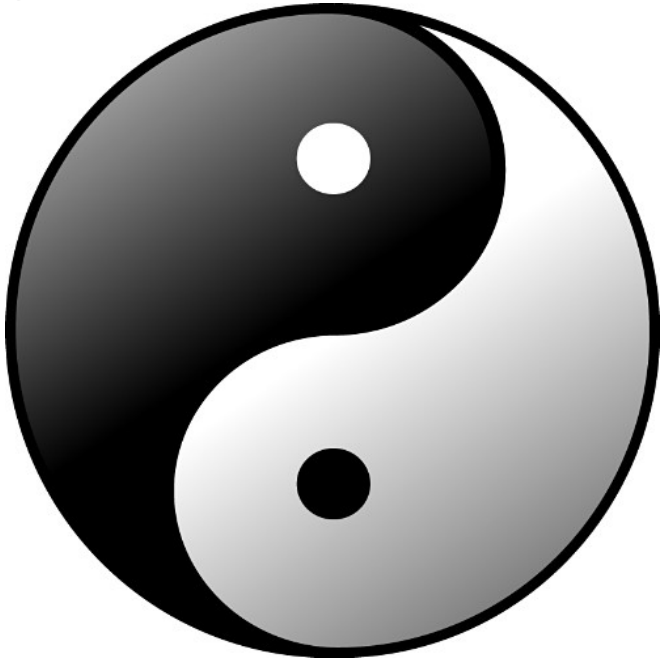
- Decouple the mission systems & integration from the platform
- Able to quickly change modular components for future flexibility
- Stabilize platform production – segregate from rapid change

## Develop/Maintain Capability Product Lines

- Reduce & manage vendor-locked & stove-piped products
- Improve core competencies across the force
- Design for robust, affordable testing
- Build in adaptability

## Integrate & Deliver

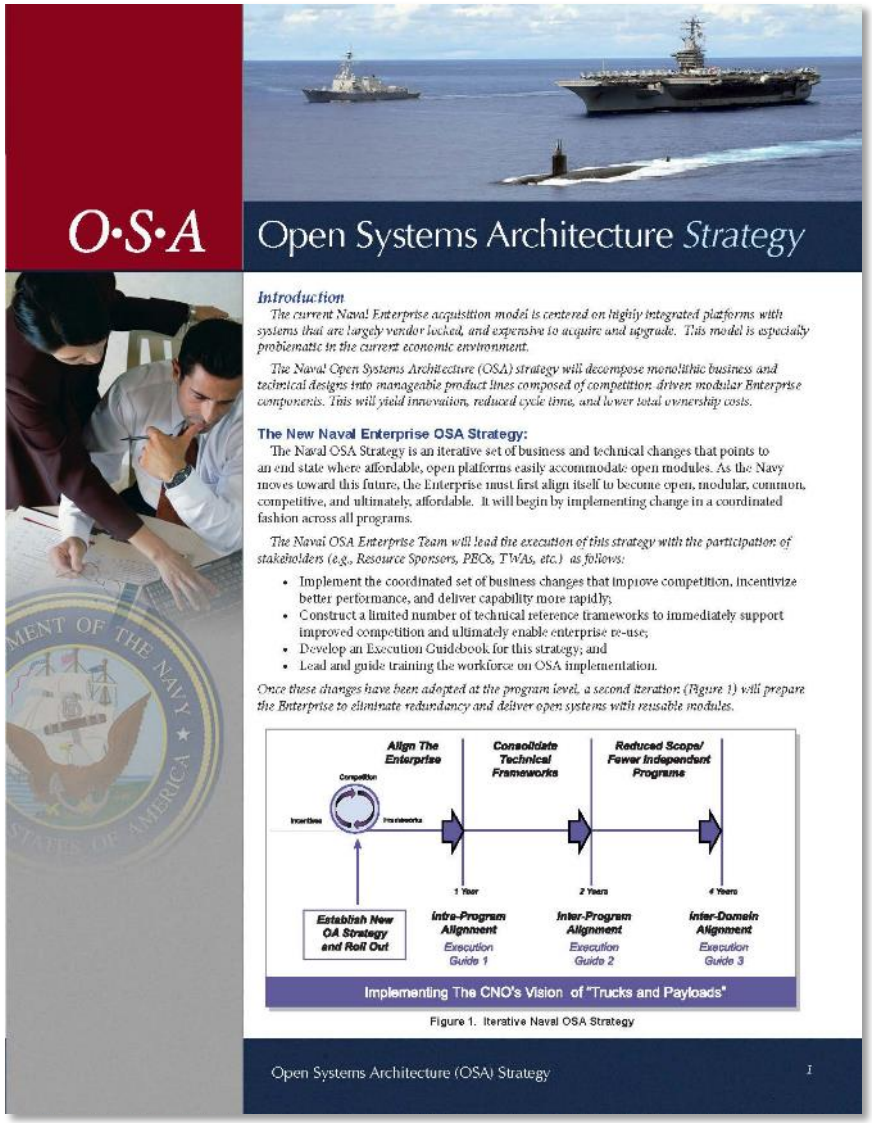
- Manage Platform-unique elements
- Reduce acquisition cost & risk
- Spur innovation & enhance warfighter capability



OSA

**This strategy requires alignment between business & technology innvoations**

# Naval Open Systems Architecture (OSA) Strategy



O·S·A

Open Systems Architecture *Strategy*

***Introduction***

*The current Naval Enterprise acquisition model is centered on highly integrated platforms with systems that are largely vendor locked, and expensive to acquire and upgrade. This model is especially problematic in the current economic environment.*

*The Naval Open Systems Architecture (OSA) strategy will decompose monolithic business and technical designs into manageable product lines composed of competition driven modular Enterprise components. This will yield innovation, reduced cycle time, and lower total ownership costs.*

**The New Naval Enterprise OSA Strategy:**

The Naval OSA Strategy is an iterative set of business and technical changes that points to an end state where affordable, open platforms easily accommodate open modules. As the Navy moves toward this future, the Enterprise must first align itself to become open, modular, common, competitive, and ultimately, affordable. It will begin by implementing change in a coordinated fashion across all programs.

*The Naval OSA Enterprise Team will lead the execution of this strategy with the participation of stakeholders (e.g., Resource Sponsors, PEOs, TWAs, etc.) as follows:*

- Implement the coordinated set of business changes that improve competition, incentivize better performance, and deliver capability more rapidly;
- Construct a limited number of technical reference frameworks to immediately support improved competition and ultimately enable enterprise re-use;
- Develop an Execution Guidebook for this strategy; and
- Lead and guide training the workforce on OSA implementation.

*Once these changes have been adopted at the program level, a second iteration (Figure 1) will prepare the Enterprise to eliminate redundancy and deliver open systems with reusable modules.*




Figure 1. Iterative Naval OSA Strategy

Open Systems Architecture (OSA) Strategy 1

- **Technical Reference Frameworks (TRFs)**
  - Defined & managed by Government/Industry consortia
  - Used across multiple air, surface, submarine & ground platforms
  - Risk Prudent, modular competition
  - Access to innovation & timely deployment of improvements
- **Open Product Lines**
  - Implement TRFs using open standards
- **An IP Strategy that breaks down barriers to entry**
  - Developing for DoD is safe
  - Protect industry investments
  - Protect Government from Vendor-Lock
- **The Navy can build on its experience in building open & common systems**

OSA

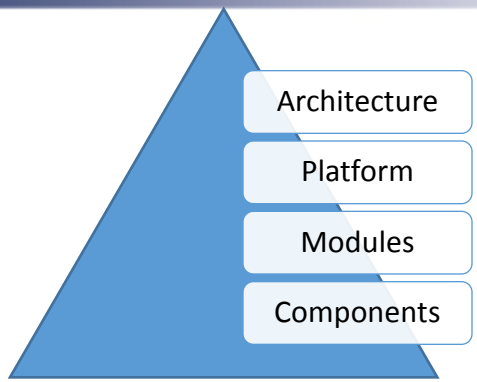
See [acc.dau.mil/osastrategy](acc.dau.mil/osastrategy)

**Emphasis is on both business & technology innovations**

# Industry Trend - Common Platforms

| Top 12 OEMs | 2010 | 2020 |
|---|---|---|
| Automobile platforms | 223 | 154 |
| Units based on 10 ten core platforms (millions) | 17 | 33 |
| Units based on OEM core platforms | 39% | 95% |
| 3 core platforms or less per OEM | | |

**Common platforms have proven track record to reduce cost & time to market**




VW MQB Common Platform

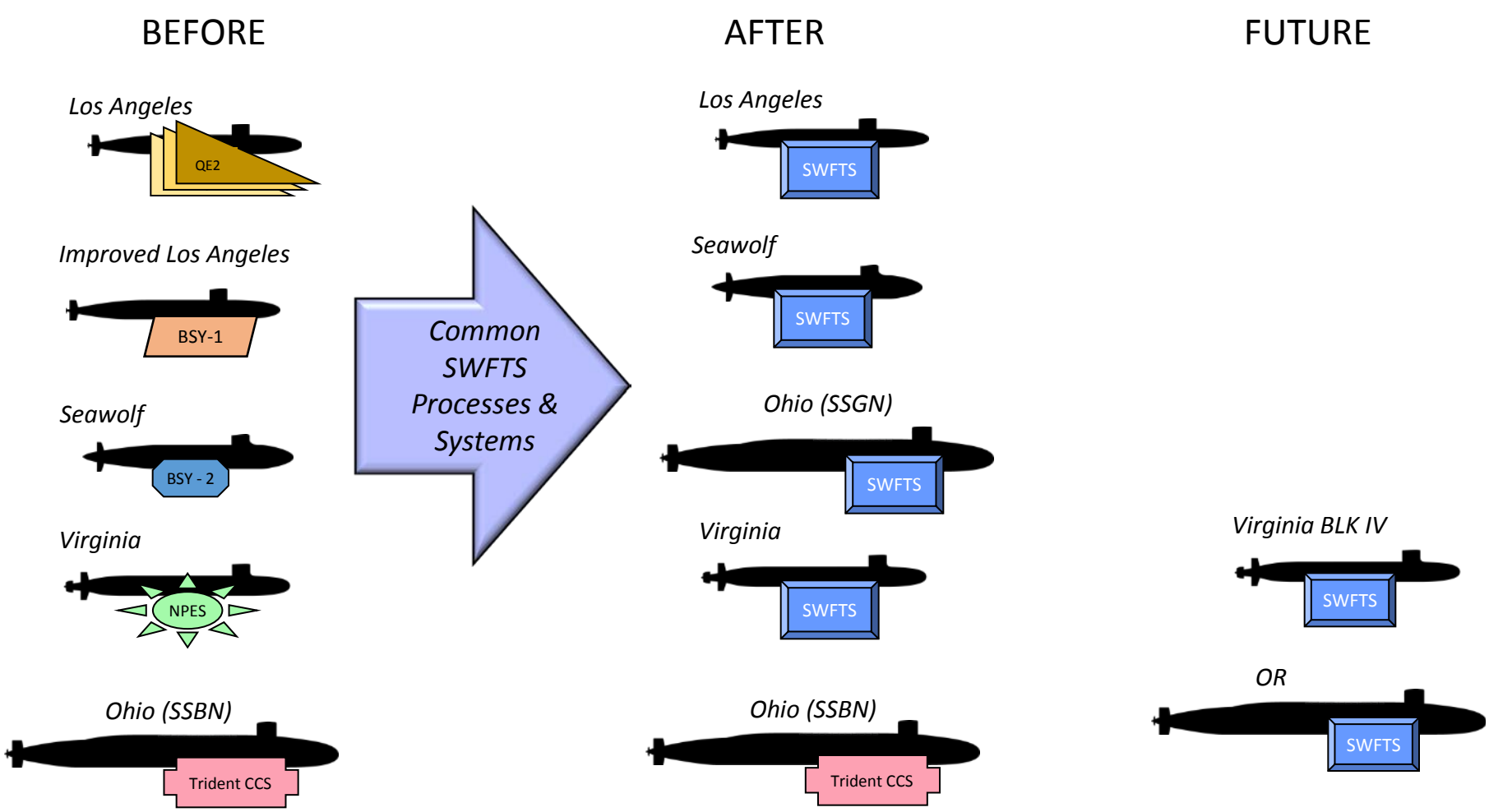
## Top 10 global megaplatforms

Forecast volume and number of models for 2017

| OEM | Platform | Volume (in mn) | No. of Models | Sample models |
|---|---|---|---|---|
| 1. VW | MQB | 6.3 | 41 | VW Golf, Passat; Audi A3 |
| 2. Toyota | MC | 5.2 | 25 | Auris, Corolla, Vibe: Scion xB |
| 3. Hyundai/Kia | HD | 3.0 | 16 | Hyundai i30; KiaCee'd |
| 4. GM | Delta | 2.5 | 19 | Opel Astra; Chevrolet Cruze |
| 5. PSA | EMP2 | 2.3 | 24 | Peugeot 308; Citroen C4, DS4 |
| 6. Renault/Nissan | B | 2.2 | 10 | Renault Clio; Nissan Cube, Juke, Leaf |
| 7. Ford | C1 | 2.2 | 18 | Focus, C-Max, Kuga |
| 8. Hyundai/Kia | PB | 1.9 | 18 | Hyundai i20; Kia Rio, Venga |
| 9. Renault/Nissan | CMF1 | 1.9 | 20 | Renault Megane, Nissan Qashqai |
| 10. Ford | B2E | 1.8 | 11 | Fiesta, B-Max; Mazda2/Demio |
| Subtotal | | 29.4 | 202 | |

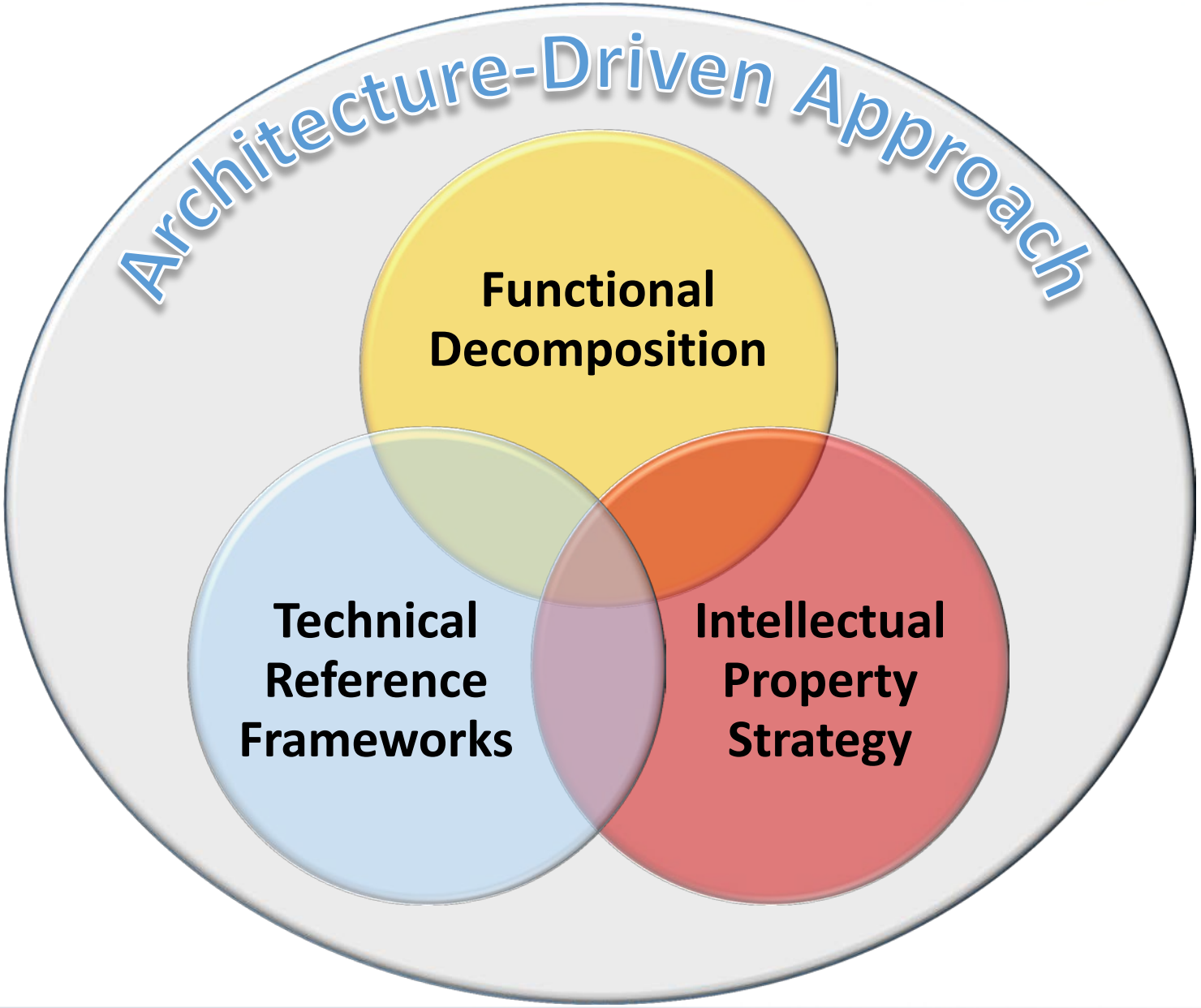
Source: IHS Automotive, AlixPartners analysis

# Product-Line Benefits in Action



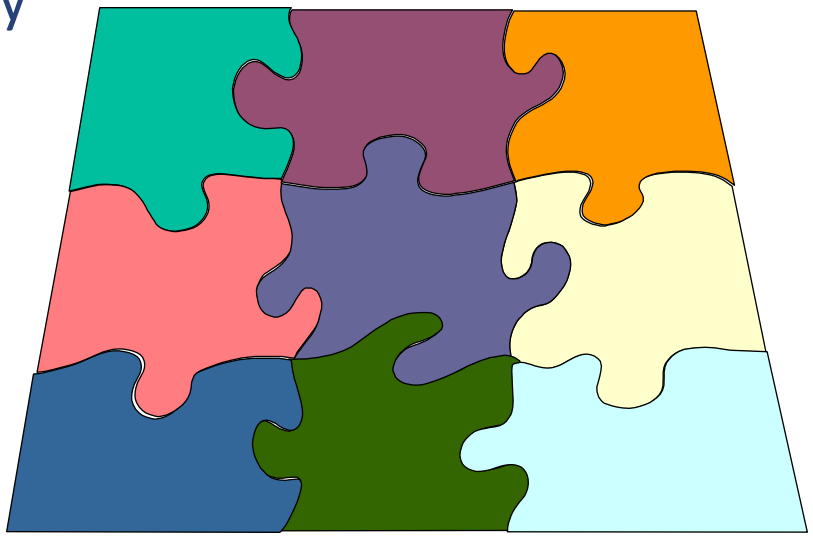

Submarine Classes Contain the Same Product-Line Subsystems
Five independent support infrastructures consolidated & continuously improved

# A Holistic OSA Product-Line Strategy



# Modular Unit Functional Decomposition

- Decompose & modularize functional capabilities
- Module contains minimum functionality suitable for enabling upgrades, competitive acquisition & cross-system portability
- Assess modular capabilities for suitability for commoditization
- Due to the depth & breadth of the modularization effort, it will be an ongoing effort over the course of multiple years
- Modularizing common capabilities enables development product lines for deliberate capability reuse

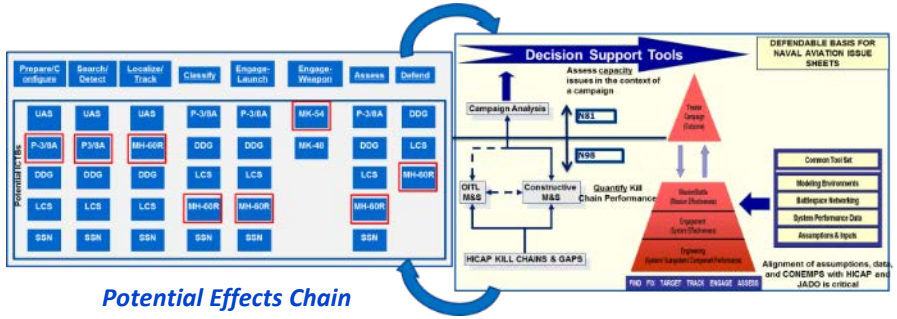


OSA

# Mission Area Capability Management

**Integrated Warfighting Capability (IWC) Enterprise Team**

**Governance**




*Potential Effects Chain*

**Mission Technical Baseline - solution agnostic**
- Timeframe, Location, Risk, Threat, Commanders Intent, Desired effects

The Triad

FLEET FORCES / COTF / MARFORCOM
Operations/Mission Need
(Desired Effect / CONOPS)

INTEGRATED CAPABILITY FRAMEWORK

ROC/POE
Mission Area/JCA

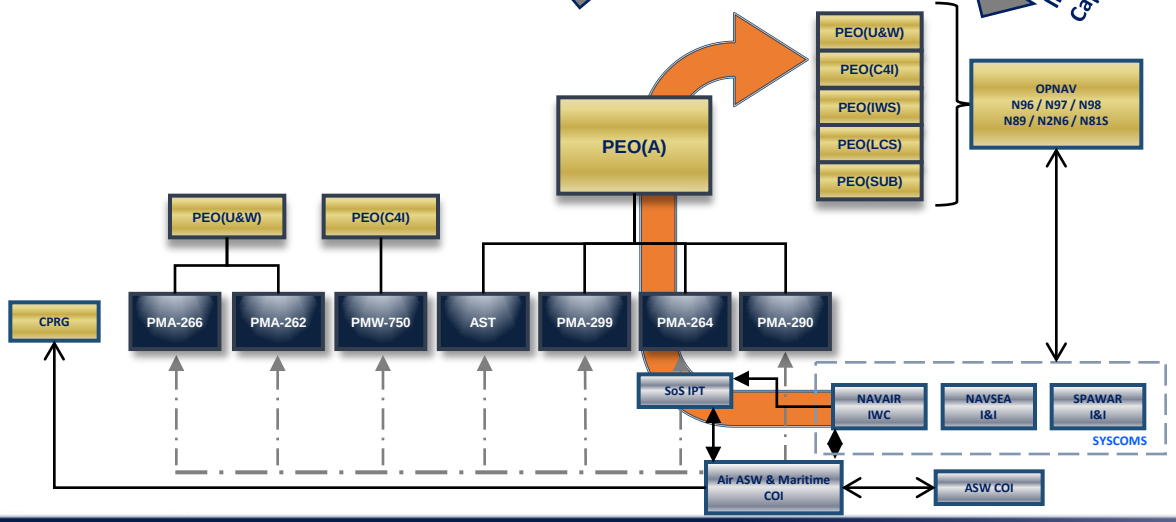
ASN(RDA)
(SYSCOM/PEO)
Execution
(Deliver Effects)

OPNAV / HQMC
Resourcing
(Validate Requirements and Resource the Programs)

**Integrated Capability Technical Baseline (ICTB)**
**(SoS requirements, interfaces & standards)**
- Capability, Affordability, Timeline Trade Space analysis

**Feedback loop**

**IWCP**
**Integrated Warfighter Capability Package**

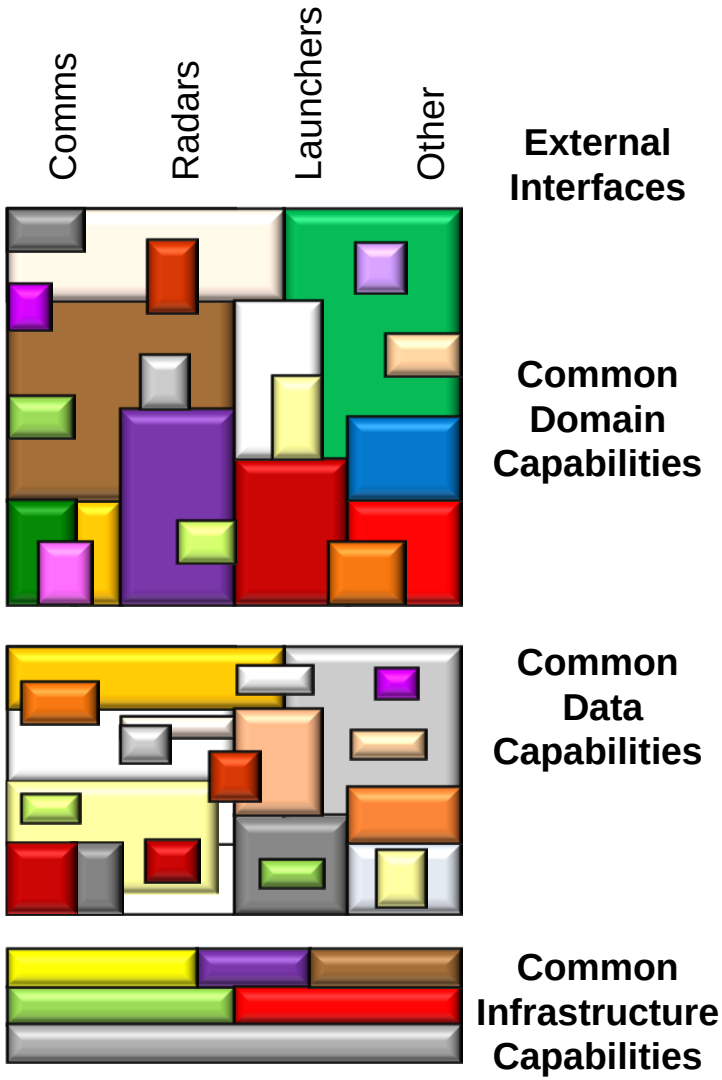



***Deliver warfighting affordable, integrated, & interoperable capabilities using open & standard processes & tools***

# Product Line Determination Method

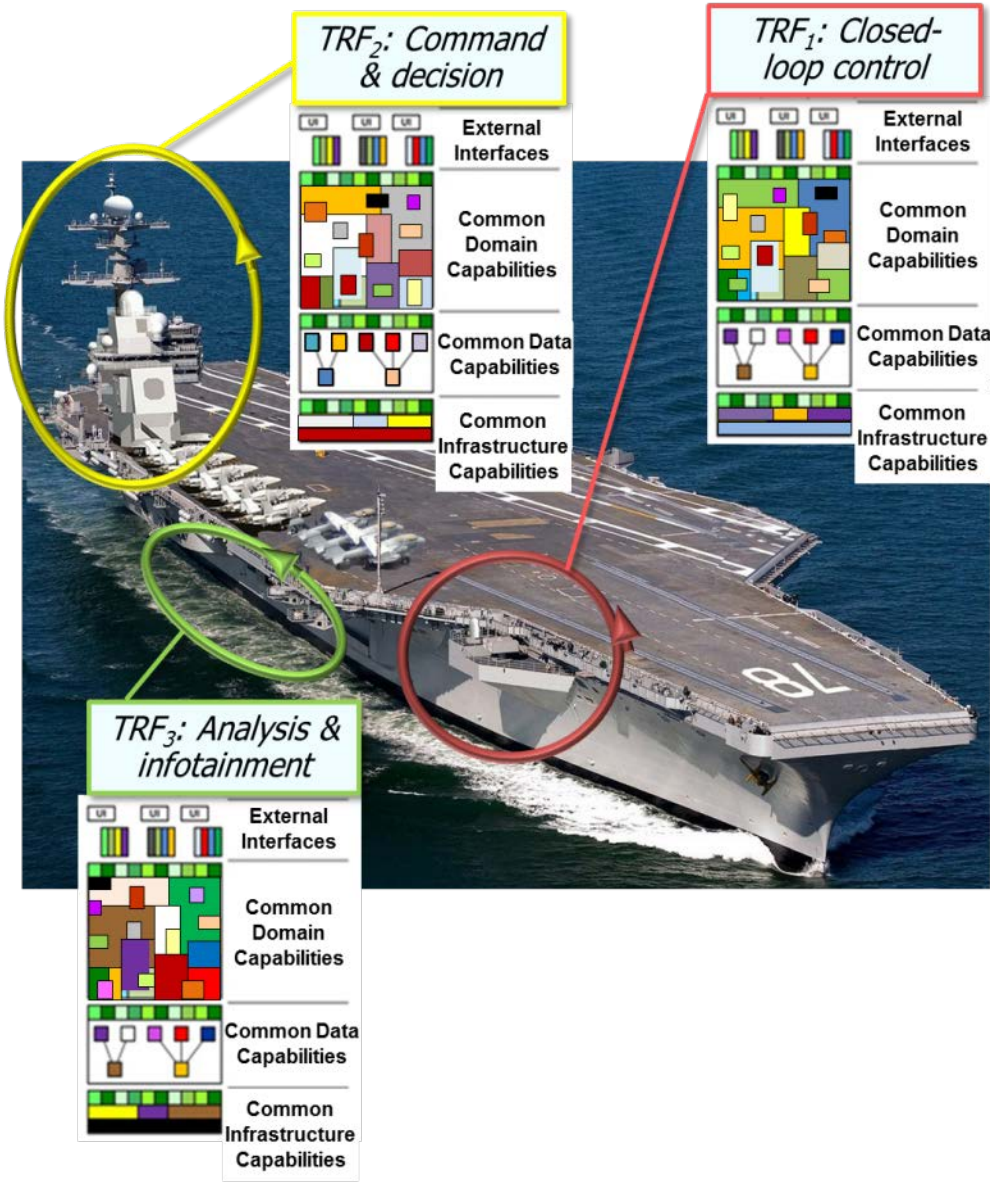
Modules defined during Functional Decomposition fall into one of four categories:

1. Common across a number of platforms & should be commoditized for savings via reuse
2. Capture/define important external interfaces & should be commoditized with a goal of increased interoperability through commonality
3. Very high rate of change & program specific
4. Truly program unique & unchanging



# Technical Reference Frameworks (TRFs)

- TRFs are key to use of OSA
  - e.g., FACE, UCS, HOST, & SPIES
- Navy has various uncoordinated TRFs at varying maturity levels
- Enterprise approach applies TRFs to enable Open Product Lines
- Must account for programmatic realities
  - New programs would use them
  - Legacy programs need to determine which TRFs to use & when
- TRFs need enterprise approach to ensure benefits & compliance



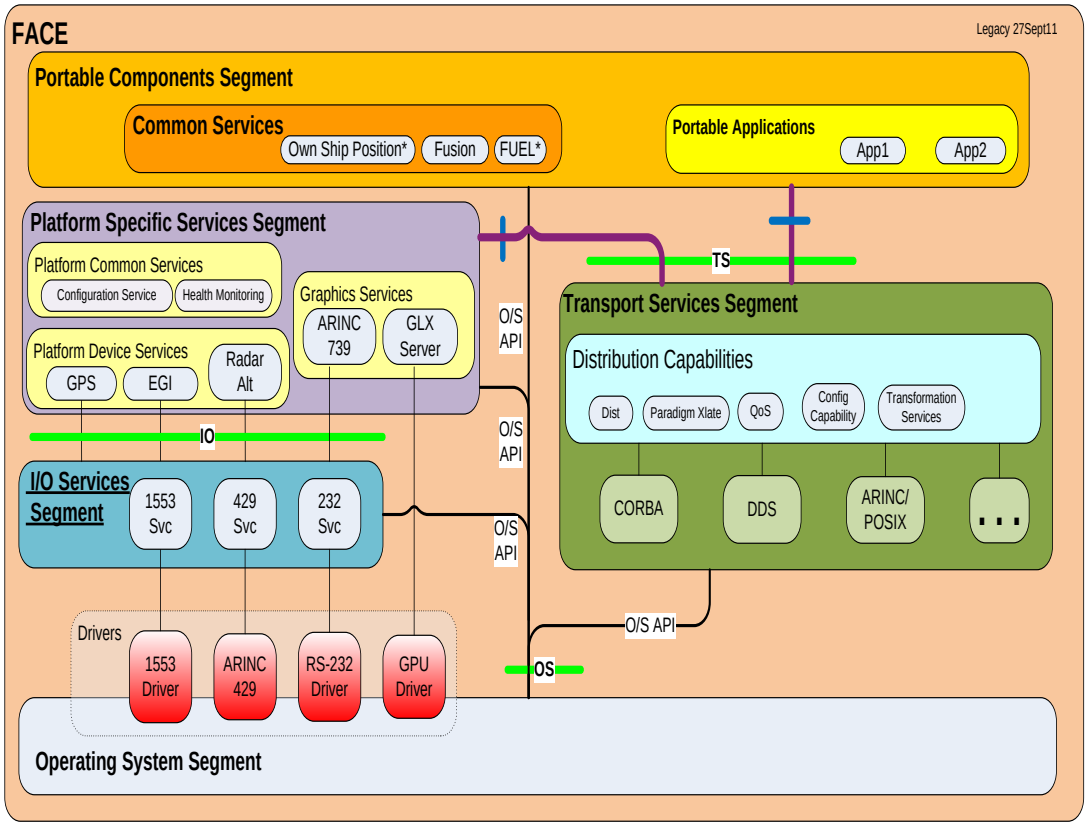

OSA

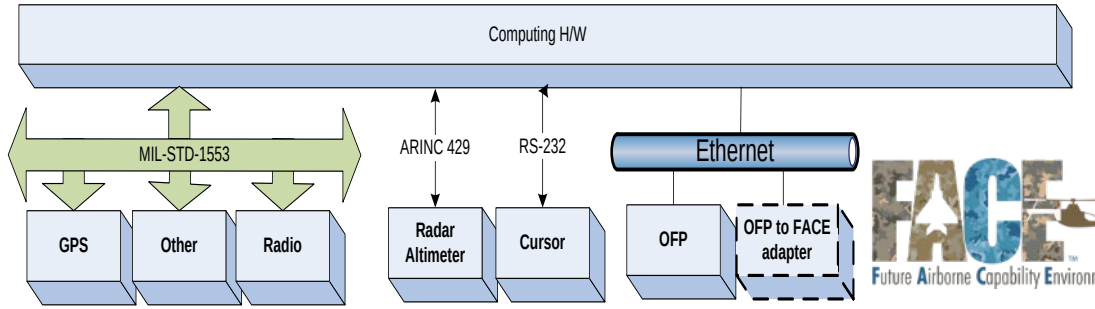
**The 2nd Step in Implementing an OA Strategy is the Strategic Use of TRFs**

# FACE – a Gov't led, Industry Supported TRF

## Key attributes

- *Crisply defined software & system technical architecture*
  - TRFs enable competition at multiple system levels

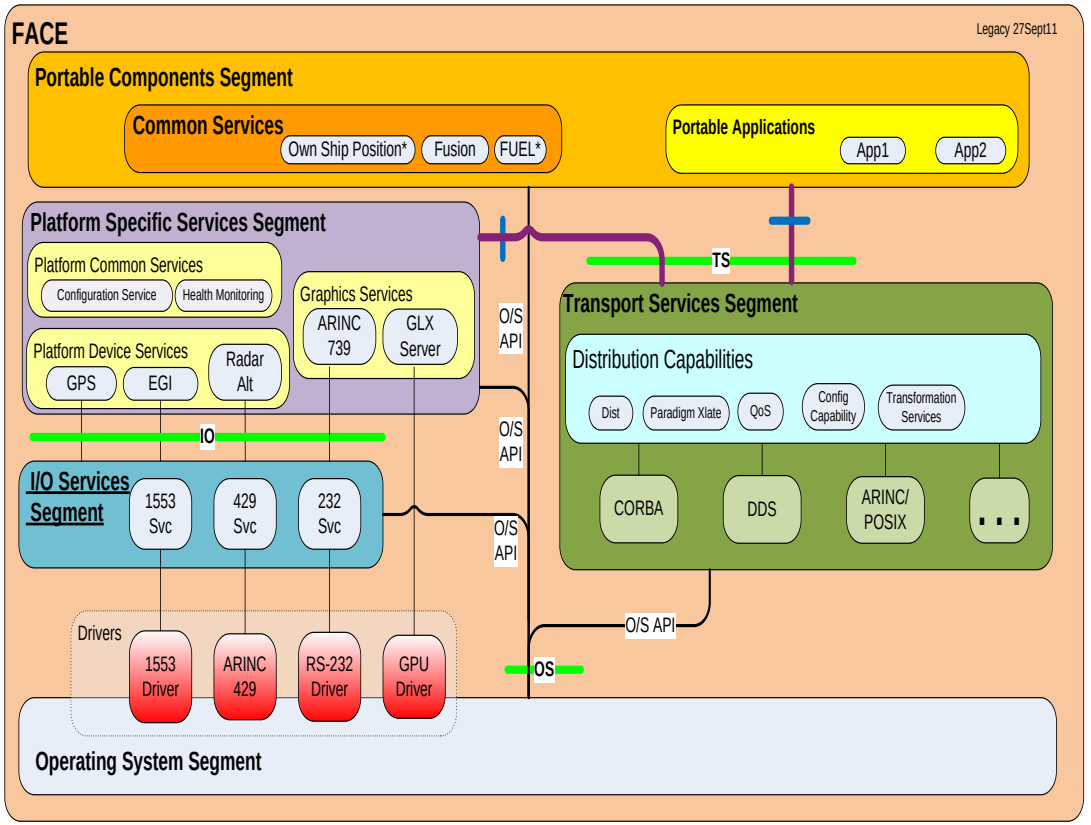


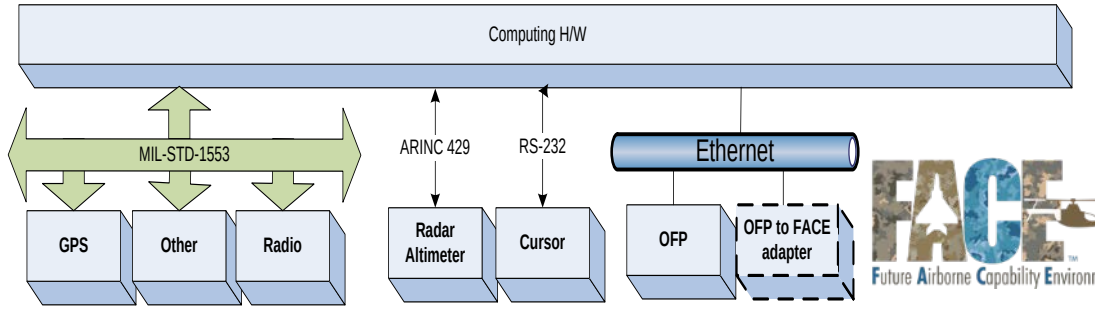



# FACE – a Gov't led, Industry Supported TRF

## Key attributes

- *Crisply defined software & system technical architecture*
- *Modular innovation potential*
  - Economically-guided criterion for (de)composing TRFs into modules

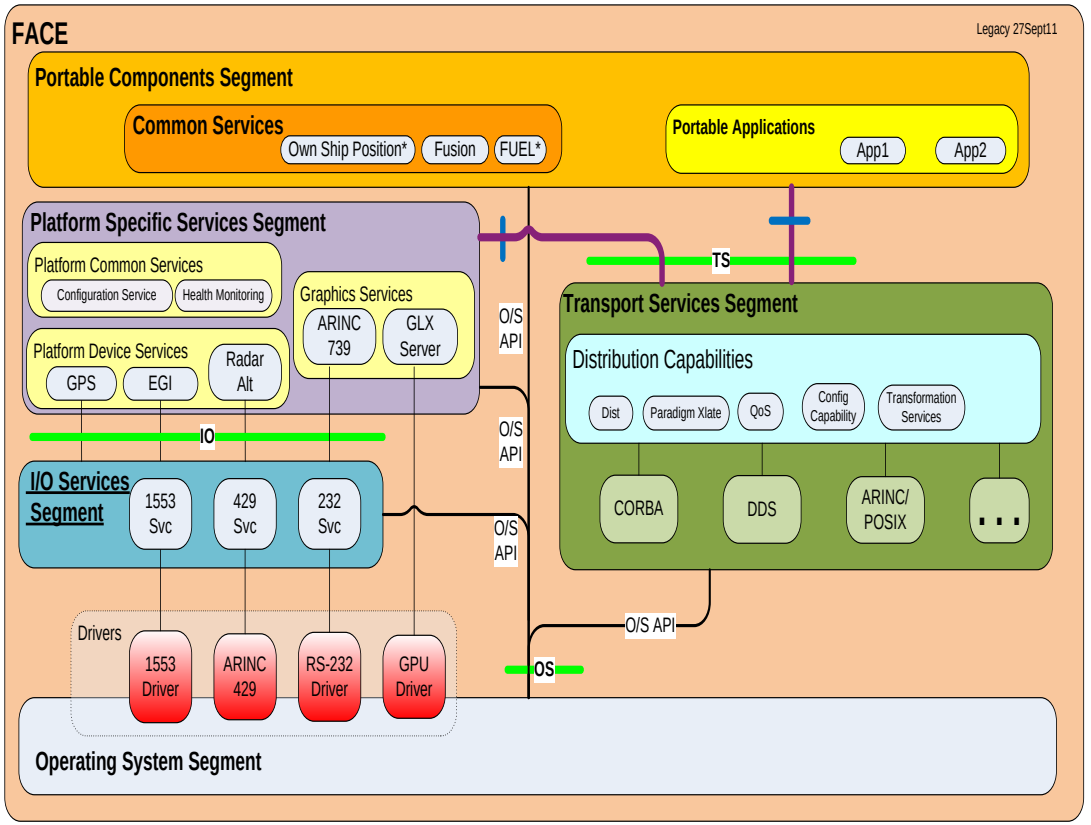


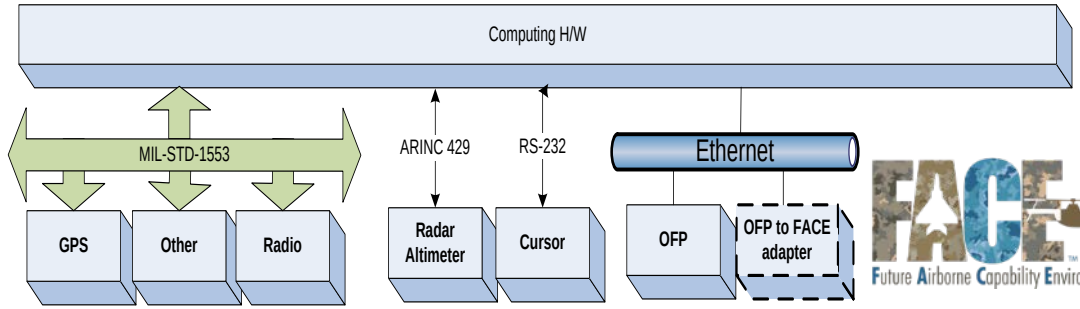



# FACE – a Gov't led, Industry Supported TRF

## Key attributes

- *Crisply defined software & system technical architecture*
- *Modular innovation potential*
- *Competitive evolutionary procurement processes*
  - Enable improvements throughout acquisition program lifecycles
  - Not just at infrequent down-selects




FACE™ Future Airborne Capability Environment

OSA

**True competition requires robust interoperable open system architectures**

# Enterprise Management Objectives

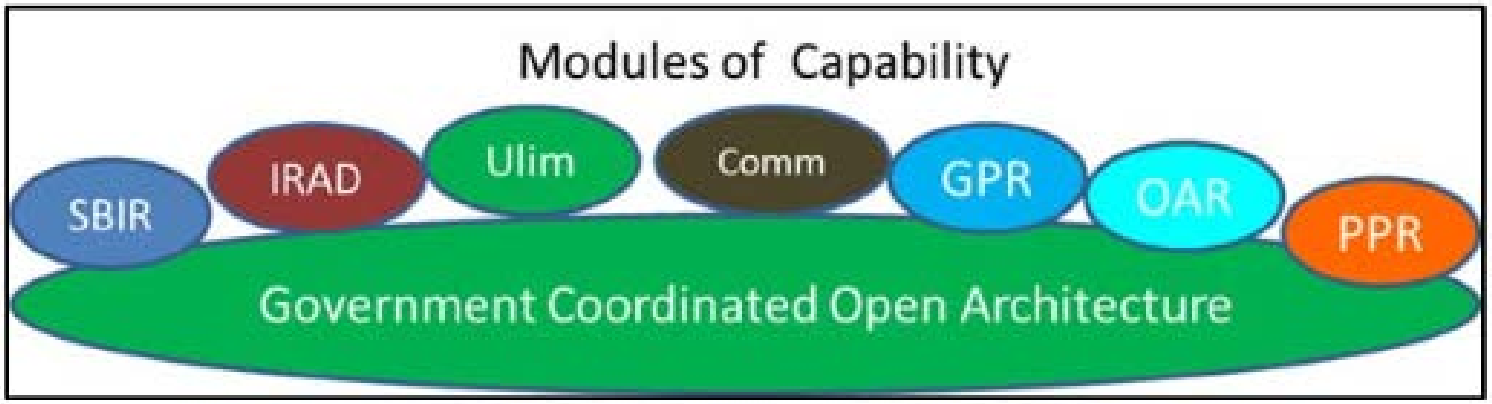
- To achieve enterprise level savings via economy-of-scale, efficiencies, & systematic reuse of common assets
- To oversee development of TRFs & Open Product Lines
- To oversee the program's cut-in plans for TRFs & Open Product Lines
- To evolve over time & across program lifecycles

OSA

**The 3rd Step in an OSA Strategy is Adoption of Open Product Lines for the Enterprise**

# Open Acquisition Intellectual Property Strategy

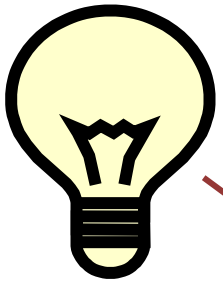
- Government as Business Integrator
- Choose where to invoke license rights to design data
  - Architecture & interfaces
  - What the Government paid to develop
- Choose where to invoke innovation
  - Where warfighting requirements change quickly
  - Where the Commercial sector is investing
  - Where there are multiple strong providers



# IP Strategy for an Open Product Line

**Competition Across the Lifecycle**

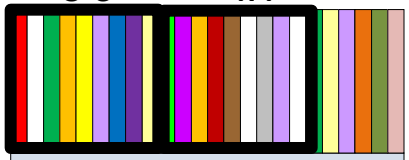
- Competition for O-C
- Replacement for R-P



TECHNOLOGY

CONTRACTS

Module 1 O-C | Module 2 R-P



Integration O-C

WARFIGHTER

REQUIREMENTS

| Functional Module 1 | Functional Module 2 | ... | Integration |
|---|---|---|---|
| O-C | R-P | | O-C |

# Benefits of Open Product Lines

Business

1. Competition for components & integration services
2. International cooperation & foreign sales opportunities
3. Wider array of providers for upgrades
4. Open currently closed markets
5. Common capabilities used across multiple platforms

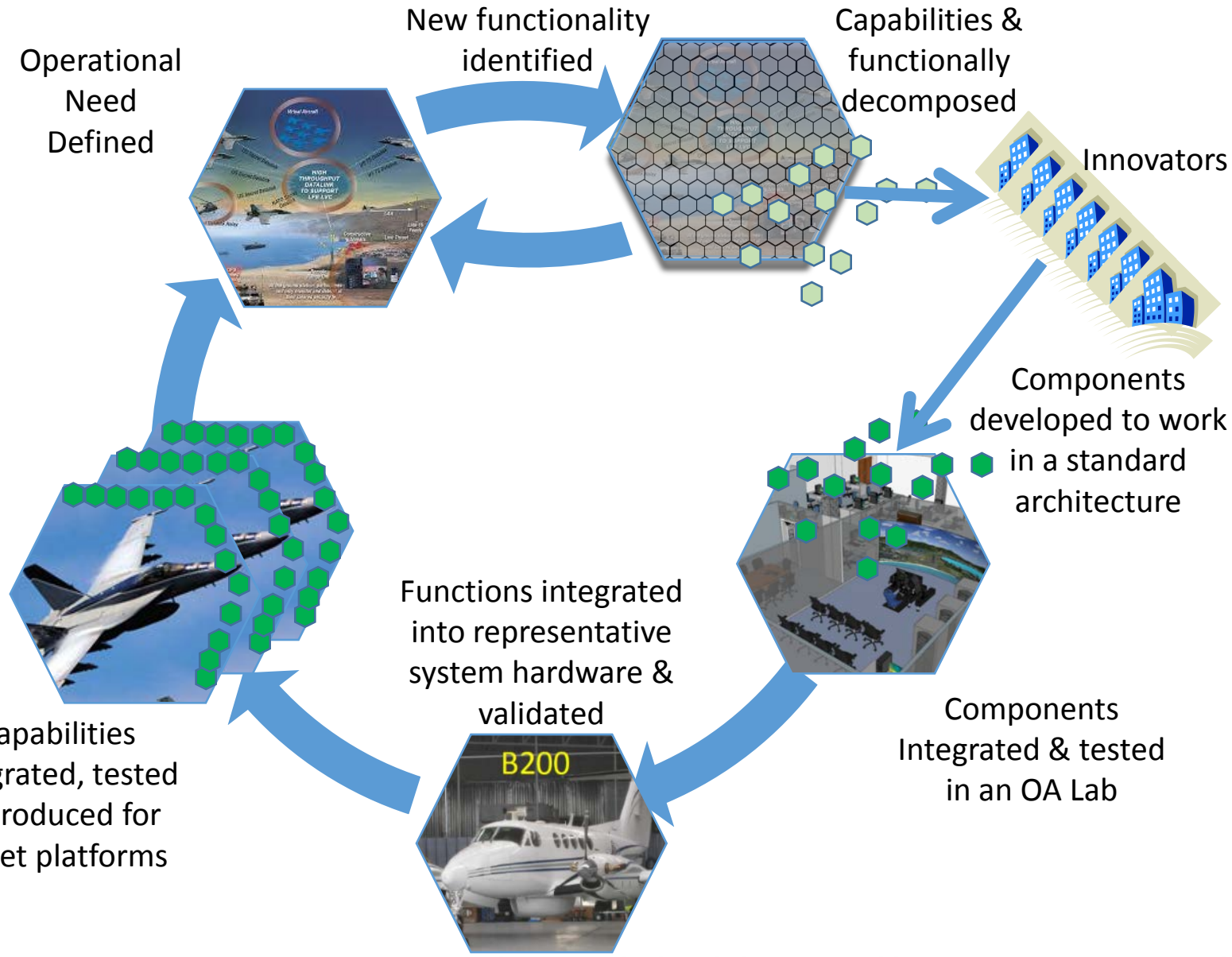
Technical

1. Common training, operations & maintenance
2. S&T risk reduction and & focus on new value
3. More robust application of CYBERSAFE techniques
4. Risk reduction for transition of new technologies
5. Consolidation of infrastructure

OSA

**We need both business & technology innovations**

# Mapping How We Get There




OSA